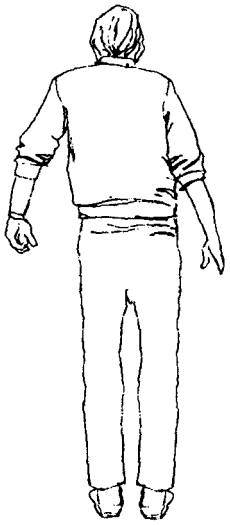
Projectile Practice

1. In the diagram below, a stationary observer on the ground watches as a seagull flying horizontally to the right drops a clamshell.



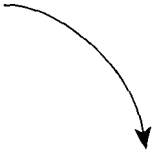
Which diagram best represents the path of the falling clamshell as seen by the observer?
[Neglect air resistance.]

1)

3)

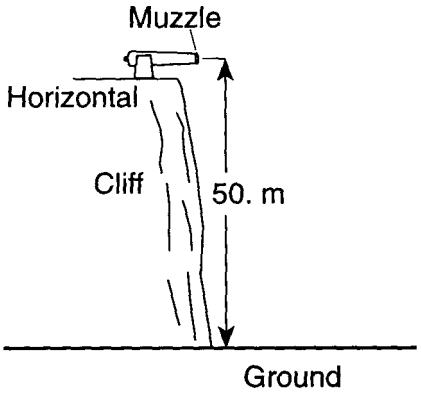
2)

4)



2. A baseball player throws a ball horizontally. Which statement best describes the ball's motion after it is thrown? [Neglect the effect of friction.]
   1) Its vertical speed remains the same, and its horizontal speed increases.
   2) Its vertical speed remains the same, and its horizontal speed remains the same.
   3) Its vertical speed increases, and its horizontal speed increases.
   4) Its vertical speed increases, and its horizontal speed remains the same.

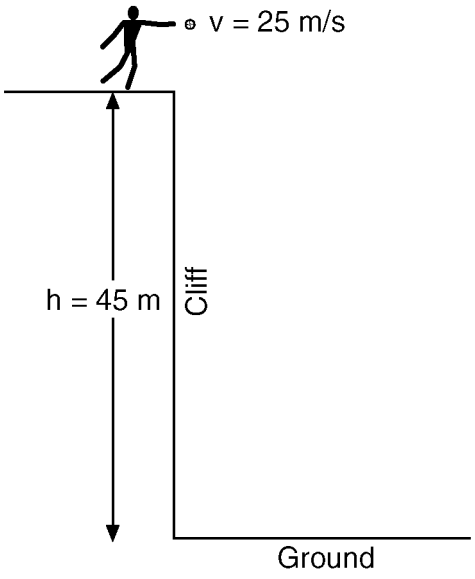
3. The diagram below shows the muzzle of a cannon located 50. meters above the ground. When the cannon is fired, a ball leaves the muzzle with an initial horizontal speed of 250. meters per second. [Neglect air resistance.]



Which action would most likely increase the time of flight of a ball fired by the cannon?
   1) pointing the muzzle of the cannon toward the ground
   2) moving the cannon closer to the edge of the cliff
   3) positioning the cannon higher above the ground
   4) giving the ball a greater initial horizontal velocity

Projectile Practice

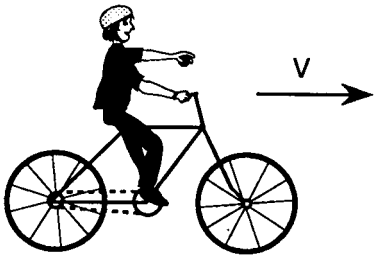
4. The diagram below shows a student throwing a baseball horizontally at 25 meters per second from a cliff 45 meters above the level ground.



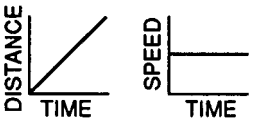
Approximately how far from the base of the cliff does the ball hit the ground? [Neglect air resistance.]

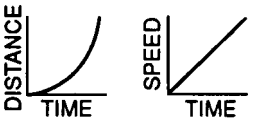
1) 45 m
2) 75 m
3) 140 m
4) 230 m

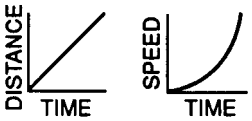
5. The diagram to the right represents a bicycle and rider traveling to the right at a constant speed. A ball is dropped from the hand of the cyclist.

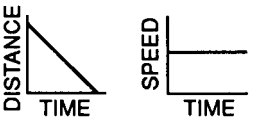


Which set of graphs best represents the horizontal motion of the ball relative to the ground? [Neglect air resistance.]

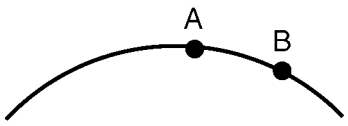
1)


2)


3)


4)


6. The diagram below represents the path of an object after it was thrown.

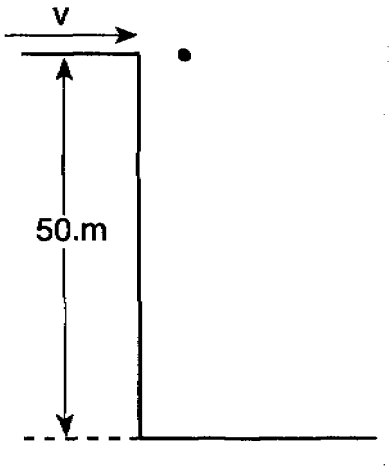


What happens to the object's acceleration as it travels from *A* to *B*? [Neglect friction.]

1) It decreases.
2) It increases.
3) It remains the same.

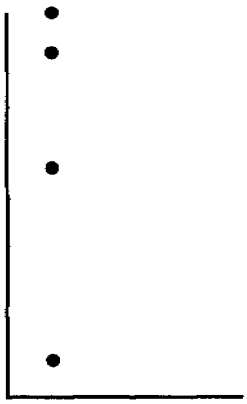
Projectile Practice

7. A ball is projected horizontally to the right from a height of 50. meters, as shown in the diagram below.

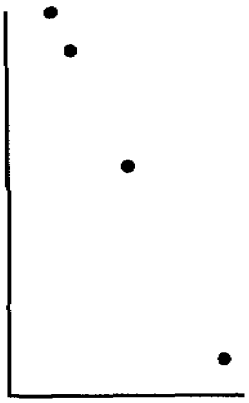


Which diagram best represents the position of the ball at 1.0-second intervals? [Neglect air resistance.]

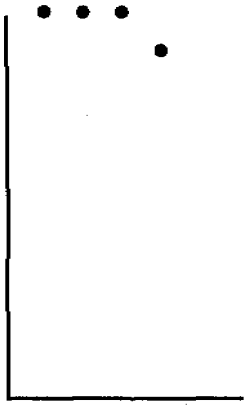
1)



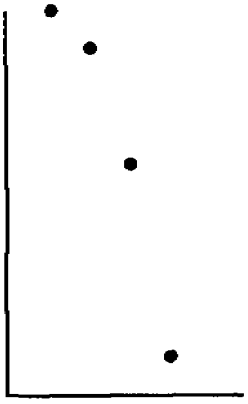
3)



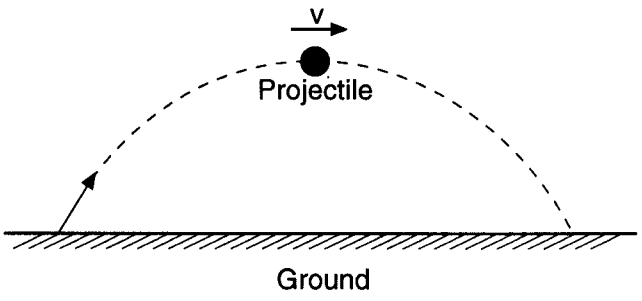
2)



4)



8. The diagram below shows a projectile moving with speed v at the top of its trajectory.



Which vector best represents the acceleration of the projectile in the position shown?

1)

3)

2)

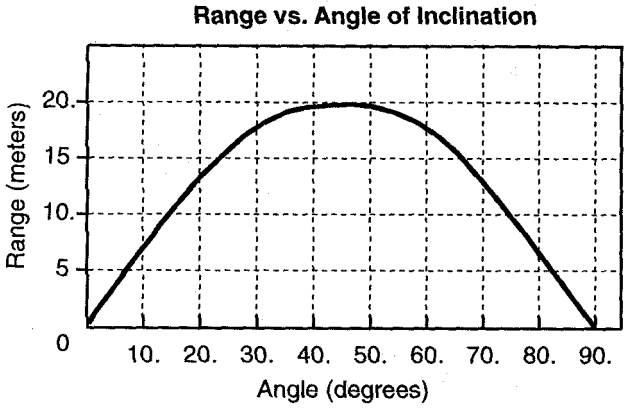
4)

9. The path of a projectile fired at a 30° angle to the horizontal is best described as
   1) parabolic
   2) linear
   3) circular
   4) hyperbolic

10. A vector makes an angle, θ, with the horizontal. The horizontal and vertical components of the vector will be equal in magnitude if angle θ is
   1) 30°
   2) 45°
   3) 60°
   4) 90°

Projectile Practice

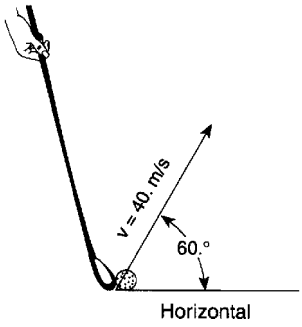
11. Projectiles are fired from different angles with the same initial speed of 14 meters per second. The graph below shows the range of the projectiles as a function of the original angle of inclination to the ground, neglecting air resistance.



The graph shows that the range of the projectiles is

1) the same for all angles
2) the same for angles of 20.° and 80.°
3) greatest for an angle of 45°
4) greatest for an angle of 90.°

12. The diagram below shows a golf ball being struck by a club. The ball leaves the club with a speed of 40. meters per second at an angle of 60.° with the horizontal.



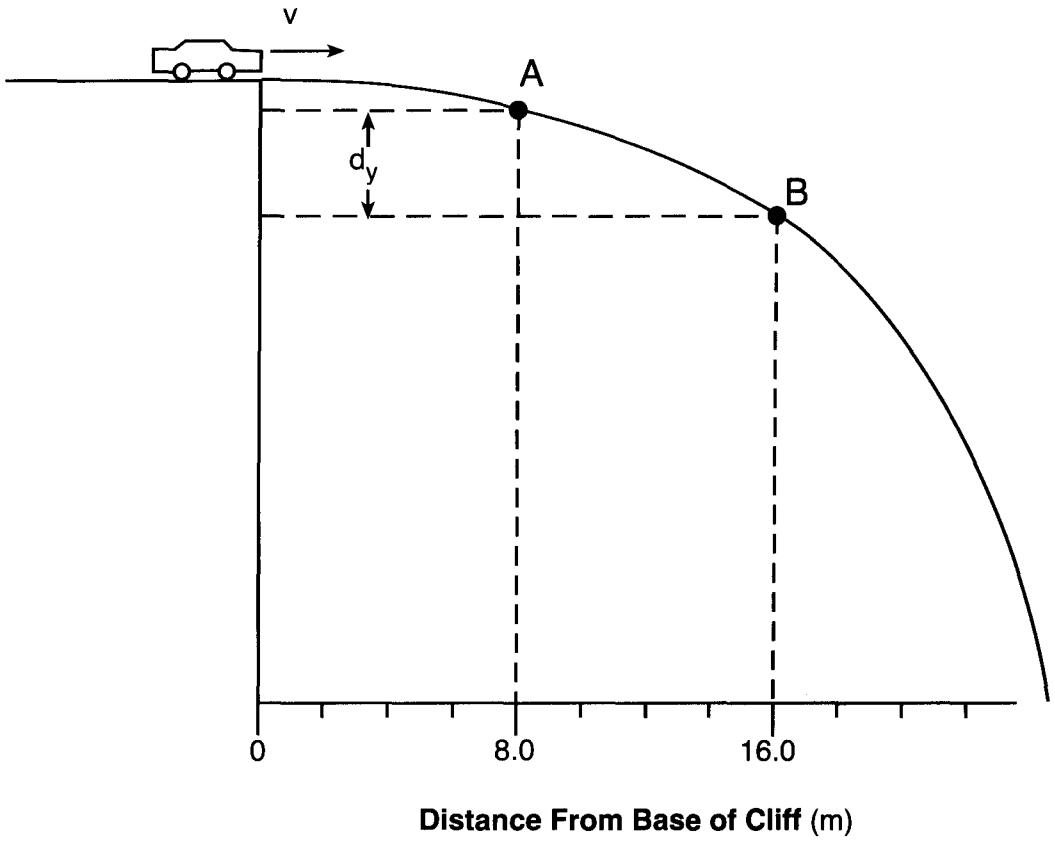
If the ball strikes the ground 7.1 seconds later, how far from the golfer does the ball land? [Assume level ground and neglect air resistance.]

1) 35 m
2) 71 m
3) 140 m
4) 280 m

Projectile Practice

Base your answers to questions **13** and **14** on the information below.

The path of a stunt car driven horizontally off a cliff is represented in the diagram below. After leaving the cliff, the car falls freely to point *A* in 0.50 second and to point *B* in 1.00 second.



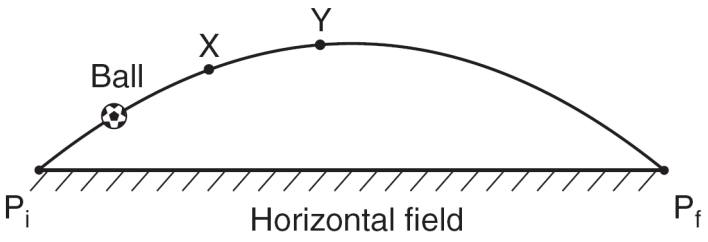
13. Calculate the magnitude of the vertical displacement, d_y, of the car from point *A* to point *B*. [Neglect friction.] [Show all work, including the equation and substitution with units.]

14. Determine the magnitude of the horizontal component of the velocity of the car at point *B*. [Neglect friction.]

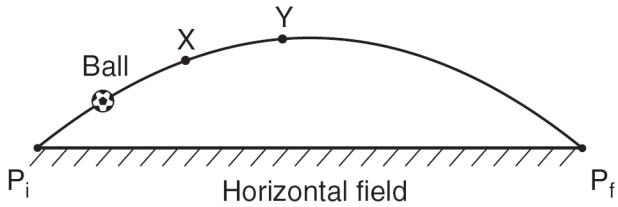
Projectile Practice

Base your answers to questions **15** and **16** on the information below.

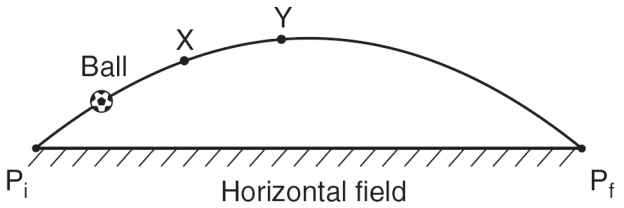
A soccer ball is kicked from point *Pi* at an angle above a horizontal field. The ball follows an ideal path before landing on the field at point *Pf* .



15. On the diagram below, draw an arrow to represent the direction of the acceleration of the ball at position *Y*. Label the arrow *a*. [Neglect friction.]



16. On the diagram below, draw an arrow to represent the direction of the net force on the ball when it is at position *X* . Label the arrow F_{net}. [Neglect friction.]



Projectile Practice

Base your answers to questions **17** through **19** on the information below.

A projectile is launched into the air with an initial speed of v_i at a launch angle of 30.° above the horizontal. The projectile lands on the ground 2.0 seconds later.

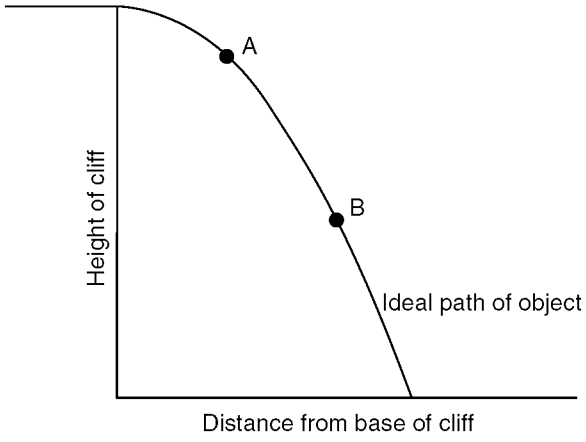
17. How does the total horizontal distance traveled by the projectile change as the launch angle is increased from 30.° to 45° above the horizontal? [Assume the same initial speed, v_i.]

18. How does the maximum altitude of the projectile change as the launch angle is increased from 30.° to 45° above the horizontal? [Assume the same initial speed, v_i.]

19. On the diagram above, sketch the ideal path of the projectile.

Base your answers to questions **20** through **22** on the information and diagram below.

An object was projected horizontally from a tall cliff. The diagram below represents the path of the object, neglecting friction.



20. On the diagram above sketch a likely path of the horizontally projected object, assuming that it was subject to air resistance.

21. How does the magnitude of the vertical component of the object's velocity at point *A* compare with the magnitude of the vertical component of the object's velocity at point *B*?

22. How does the magnitude of the horizontal component of the object's velocity at point *A* compare with the magnitude of the horizontal component of the object's velocity at point *B*?

Projectile Practice
Answer Key
projectiles reg practice [Dec 03, 2015]

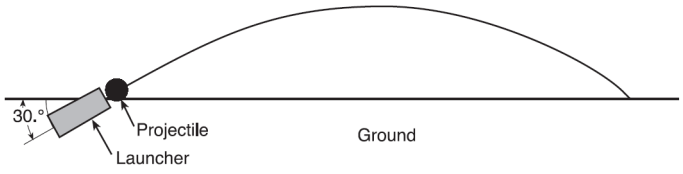
1. 4
2. 4
3. 3
4. 2
5. 1
6. 3
7. 4
8. 4
9. 1
10. 2
11. 3
12. 3
13.

$$d = v_i t + \frac{1}{2} a t^2$$

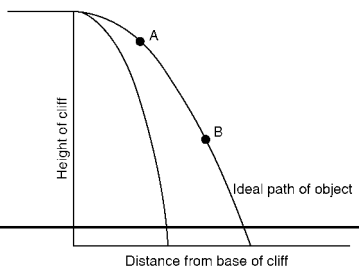
$$d_y = (4.9 \text{ m/s}) (0.50 \text{ s}) + \frac{1}{2}(9.81 \text{ m/s}^2) (0.50 \text{ s})^2$$

$$d_y = 3.7 \text{ m}$$

14. 16 m/s
15. An arrow at *Y* toward the ground and perpendicular to the ground.
16. An arrow at *X* toward the ground and perpendicular to the ground.
17. The total horizontal distance will increase.
18. The projectile's maximum altitude will increase.
19.



20. **Example of an Acceptable Response**



21. Velocity (or vertical velocity) at *A* is less than at *B*.
22. The horizontal velocities at *A* and *B* are the same.